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VICE-PRESIDENT
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NOV 6 1984

Docket No. 50-352
50-353

Dr. Thomas E. Murley
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region I
631 Park Ave.
King of Prussia, PA 19406

Subject: I.E. Bulletin 84-03 - Refueling Cavity Water Seal

Dear Dr. Murley:

In response to the subject I.E. Bulletin, Philadelphia Electric Company has evaluated the potential for and consequences of a refueling cavity water seal failure at Limerick Generating Station Units 1 and 2. Unit 1 is currently licensed for low power testing, and Unit 2 holds a Construction Permit.

The results of our evaluation are as stated below:

Attachment 1 shows the arrangement of the refueling bellows and the inflatable ring seals. The refueling seal assemblies at Limerick utilize both metal bellows and inflatable ring seals. Type 304 stainless steel bellows seals (per ASTM-A240) prevent water from entering the primary containment when the reactor cavity is flooded for refueling. Redundant inflatable ring seals (per ANSI/ASTM-D2000) are used to prevent water from entering the Reactor Building under the same conditions.

A self-energizing spring seal is installed on the refueling bellows as a secondary seal. If the bellows seal developed a leak which had a leakage rate greater than can be drained by its 1½" diameter drain line, the secondary seal will prevent significant leakage from entering the primary containment. Bellows seal leakage is alarmed both locally and in the main control room. The alarm is initiated at 1½ gallons per minute (gpm) leak rate. Gross failure of the bellows seal would require structural failure of welded components. This event is considered to be highly unlikely.

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The redundant inflatable ring seals are located in the annular space between the reactor cavity wall and the refueling ring. Each seal alone is designed to withstand the full hydrostatic pressure during refueling. The configuration consists of a top and bottom annular seal. The top seal rests on a removable bent plate, and the bottom seal is captured on a permanent bar 2 3/4" wide. Even with the seals totally deflated, it would be impossible for the seals to be vertically displaced.

During refueling, both ring seals are pressurized to approximately 52.5 psig. Each seal is independently supplied by service air for inflation, with a separate nitrogen bottle, which will automatically actuate to maintain the necessary air pressure as backup. There are independent three-way manual valves located in separate pits directly below the refueling floor that control the direction of air flow to or from the seals. These valves are kept locked in the open position to inflate the seals, with the key held by the shift superintendent. There is a local and main control room alarm to indicate a low pressure in the seal. If the top ring seal developed a leak because of a loss of air pressure, then sealing capability would be assured by the redundant bottom ring seal.

The annular space occupied by the seals is covered by stainless steel plates with compressible seals at each edge. The cover plates act to reduce the leakage flow due to inflatable ring seal failure.

If any water leakage were to develop through the seals, the water would be collected in a trough located below the seals. From the trough, the water would flow through an 8" diameter drain pipe which goes directly to the equipment drain collection tank. In the event of failure of both inflatable ring seals, the leakage through the small gaps at the butt joints of the seal cover plates has been calculated to be about 780 gpm leak rate. This leak rate is significantly less than the maximum flow rate that the drain can pass. The drain can pass 3,300 gpm, thereby avoiding spillage of water to the Reactor Building. The loss of inventory in the refueling cavity can be made up from the condensate storage tank and the refueling tank at a faster rate than the calculated leakage. As with the stainless steel bellows, leakage through the inflatable seals will be alarmed both locally and in the main control room at $1\frac{1}{2}$ gpm leak rate.

The possibility that fuel could be uncovered in the Spent Fuel Pool is precluded because the bottom of the refueling transfer channel is above the level of the top of active fuel stored in the pool. Available sources of makeup to the Spent Fuel Pool are of sufficient capacity to maintain spent fuel pool inventory to preclude fuel cladding damage. Also, fuel stored in the Reactor Pressure Vessel (RPV) will not be affected by a failure of the refueling cavity seal system because the RPV will remain flooded. If fuel were actually being transferred at the time of a seal assembly leak, there would be sufficient time for the fuel to be returned to either the Reactor Pressure Vessel or its storage location at the bottom of the Spent Fuel Pool before it would be uncovered. Procedures requiring the

Spent Fuel Pool gates to be installed after the fuel has been transferred will be in effect prior to any movement of irradiated fuel. This practice will minimize the amount of time that there would be a potential to drain water from the Spent Fuel Pool due to seal or bellows leakage.

Based on the above discussion, a gross failure of the refueling seal system and the resulting consequences, similar to the one described in I.E. Bulletin 84-03, is considered incredible for Limerick.

Very truly yours,

John S. Kemper

MAB/dmm/10038405
Attachments
Copy to: James T. Wiggins, Sr. Resident Inspector
See Attached Service List

cc: Judge Helen F. Hoyt (w/enclosure)
Judge Jerry Harbour (w/enclosure)
Judge Richard F. Cole (w/enclosure)
Judge Christine N. Kohl (w/enclosure)
Judge Gary J. Edles (w/enclosure)
Judge Reginald L. Gotchy (w/enclosure)
Troy B. Conner, Jr., Esq. (w/enclosure)
Ann P. Hodgdon, Esq. (w/enclosure)
Mr. Frank R. Romano (w/enclosure)
Mr. Robert L. Anthony (w/enclosure)
Ms. Phyllis Zitzer (w/enclosure)
Charles W. Elliot, Esq. (w/enclosure)
Zori G. Ferkin, Esq. (w/enclosure)
Mr. Thomas Gerusky (w/enclosure)
Director, Penna. Emergency Management Agency (w/enclosure)
Angus R. Love, Esq. (w/enclosure)
David Wersan, Esq. (w/enclosure)
Robert J. Sugarman, Esq. (w/enclosure)
Martha W. Bush, Esq. (w/enclosure)
Spence W. Perry, Esq. (w/enclosure)
Jay M. Gutierrez, Esq. (w/enclosure)
Atomic Safety & Licensing Appeal Board (w/enclosure)
Atomic Safety & Licensing Board Panel (w/enclosure)
Docket & Service Section (w/enclosure)
Mr. James Wiggins (w/enclosure)
Mr. Timothy R. S. Campbell (w/enclosure)

COMMONWEALTH OF PENNSYLVANIA:

: ss.

COUNTY OF PHILADELPHIA :

J. S. Kemper, being first duly sworn, deposes and says:

That he is Vice President of Philadelphia Electric Company; that he has read the foregoing response to I.E. Bulletin 84-03 and knows the contents thereof; and that the statements and matters set forth therein are true and correct to the best of his knowledge, information, and belief.

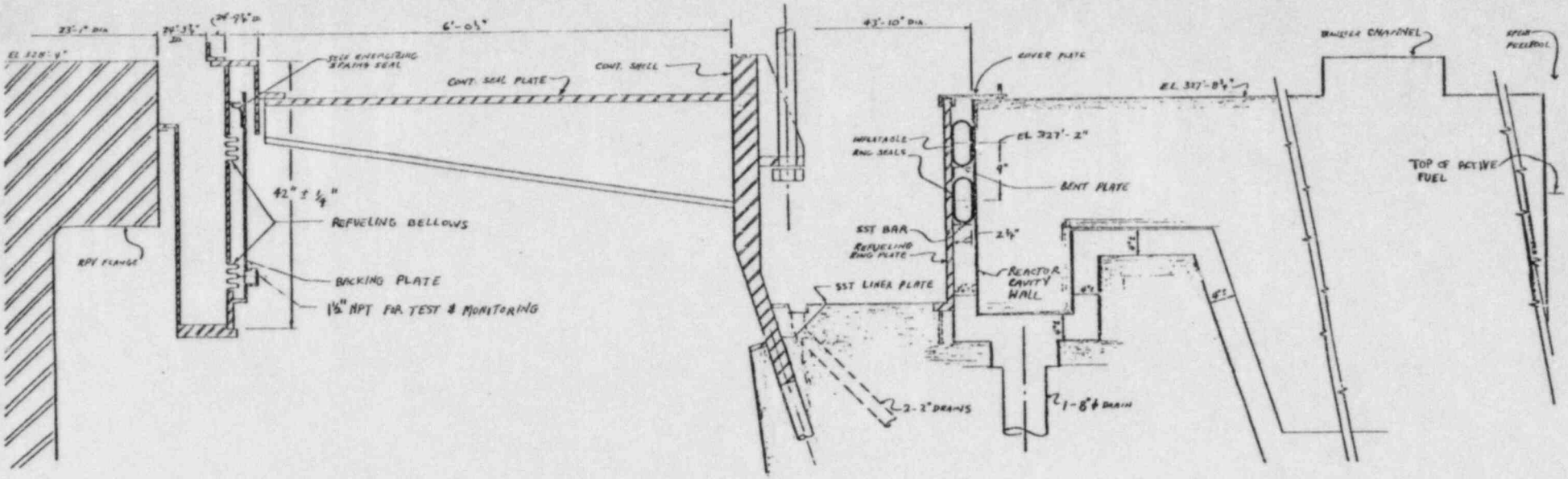
J S Kemper

Subscribed and sworn to
before me this 6th day
of November 1984

Patricia D. Scholl
Notary Public

PATRICIA D. SCHOLL
Notary Public, Philadelphia, Philadelphia Co.
My Commission Expires February 10, 1986

REFUELING BELLOWS & INFLATABLE RING SEALS



ATTACHMENT 1